

Subgradient

Nipun Batra

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IIT Gandhinagar

- Generalizes gradient to convex but non-differentiable problems

Subgradient

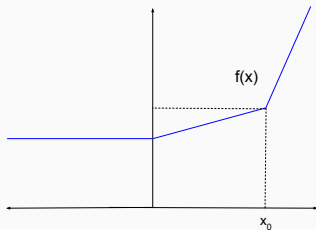
- Generalizes gradient to convex but non-differentiable problems
- Examples:

Subgradient

- Generalizes gradient to convex but non-differentiable problems
- Examples:
 - $f(x) = |x|$

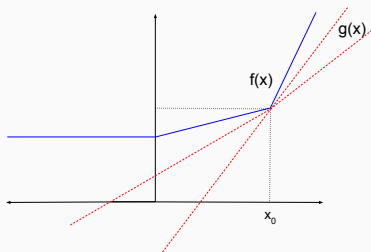
Task at hand

- TASK: find derivative of $f(x)$ at $x = x_0$



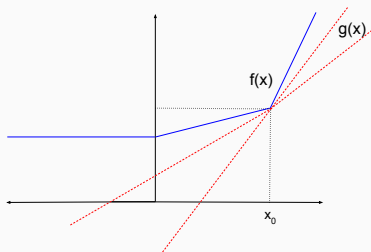
Solution

- Construct a differentiable $g(x)$



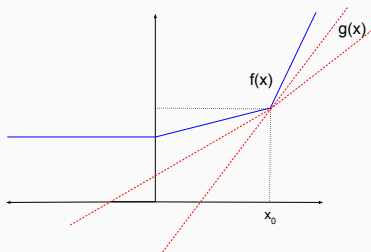
Solution

- Construct a differentiable $g(x)$
 - Intersecting $f(x)$ at $x = x_0$



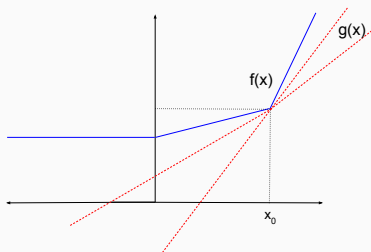
Solution

- Construct a differentiable $g(x)$
 - Intersecting $f(x)$ at $x = x_0$
 - Below or on $f(x)$ for all x



Solution

- Compute slope of $g(x)$ at $x = x_0$



Another Example: $f(x) = |x|$

- Subgradient of $f(x)$ belongs to $[-1, 1]$

